

WHAT IS CLAIMED IS:

1. A probe for detecting light or irradiating light, comprising:

5 a cantilever supported at an end thereof by a substrate;

a hollow tip formed at a free end of the cantilever;

a microaperture formed at the end of the tip;

and

10 a hollow waveguide formed inside the cantilever.

15 2. The probe according to claim 1, wherein said waveguide has a V-shaped transversal cross section.

3. The probe according to claim 1, wherein said waveguide has a trapezoidal transversal cross section.

20 4. The probe according to claim 1, wherein said waveguide has a U-shaped transversal cross section.

25 5. The probe according to claim 1, wherein said tip is shaped as a square cone.

6. The probe according to claim 1, wherein the

direction of the end of said tip is substantially perpendicular to the longitudinal direction of said cantilever.

5                   7. The probe according to claim 1, wherein said cantilever is principally composed of silicon.

10                   8. The probe according to claim 1, wherein said probe is provided therein with a mirror for guiding light transmitted in a hollow interior of said hollow waveguide to said microaperture or guiding light entering from said microaperture to said hollow waveguide.

15                   9. The probe according to claim 1, wherein said mirror is a concave mirror.

20                   10. A method for producing a probe for light detection or light irradiation, which comprises the steps of:

                  working a substrate to form a groove therein,  
                  forming a flat plate-shaped cover portion on the groove to form a hollow waveguide having an opening in a part thereof,  
25                   forming a hollow tip having a microaperture on the opening, and  
                  removing a part of the substrate by etching, to

form a cantilever.

11. The method according to claim 10, wherein said groove is formed by etching said substrate.

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12. The method according to claim 11, wherein said groove is formed by crystal-anisotropic etching of said substrate.

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13. The method according to claim 10, further comprising a surface treatment step of forming said groove or said cover portion into a mirror surface state.

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14. The method according to claim 10, wherein said cover portions is formed from an SOI (silicon on insulator) layer of an SOI substrate.

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15. The method according to claim 10, wherein said cover portion is formed by filling said groove with a resin layer and forming a metal film on said resin layer.

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16. The method according to claim 10, wherein said step of forming said hollow tip having said microaperture on said opening comprises the steps of:

forming a film of a tip material on a recess

formed on a substrate,

transferring the tip material onto the opening,

and

etching the end of a follow tip resulting from

5 the transferring step to form the microaperture.

17. The surface observation apparatus provided  
with at least one probe selected from the group  
consisting of probes according to any one of claims 1  
10 to 9 and probes produced by a method according to any  
one of claims 10 to 16.

18. An exposure apparatus provided with at  
least one probe selected from the group consisting of  
15 probes according to any one of claims 1 to 9 and probes  
produced by a method according to any one of claims 10  
to 16.

19. An information processing apparatus  
20 provided with at least one probe selected from the  
group consisting of probes according to any one of  
claims 1 to 9 and probes produced by a method according  
to any one of claims 10 to 16.